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ABSTRACT

A statewide survey of the technology needs of 104 children with physical disabilities aged 0-5 years was conducted in Arkansas as a component of the grant application process of Public Law 100-407 (the Technology-Related Assistance for Individuals with Disabilities Act of 1988). The survey analyzed satisfaction with assistive devices technology and services, expenditures for assistive technology and services, travel required to receive technology and services, and funding sources. Unmet technology needs were reported for the children in all areas of life functioning, including hearing aids; specialized cars, vans, and buses; vision aids; reading, writing, and typing aids; building accessibility; taking care of the home; using a computer; and using a telephone. Most children were evaluated preceding the provision of assistive technology. Families reported a substantial need for the opportunity to purchase technology on a credit plan. More than half of the children were unable to try out the technology before it was purchased. A need for more information about assistive technology and services and a need for transportation services to acquire technology and services were reported for the majority of children. (Approximately 75 references.) (JDD)

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A Question of Assistive Technology and Services for Young Children with Physical Disabilities

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A Question of Assistive Technology and Services

for Young Children with Physical Disabilities

A statewide survey of the technology needs of 104 children with physical disabilities aged 0-5 years was conducted in Arkansas as a component of P.L. 100-407 grant application processes. Unmet technology needs were reported for these children in all areas of life functioning. In more than 1/2 of these areas, needs exceeded usage of technology, particularly in the areas of telephone usage, use of computers, and taking care of the home. It was reported for most children that evaluations preceded the provision of assistive technology . A substantial need was reported by families for the opportunity to purchase technology on a credit plan. Also, more than 1/2 of the children were unable to try out their technology before it was purchased. A need for more information about assistive technology and services was reported for more than 3/4 of these children. Lack of transportation services was reported for most children, with families of 2/3 of the children indicating travel exceeding 50 miles to receive technology and services. Implications for future research are discussed.

A Question of Assistive Technology and Services
for Young Children with Physical Disabilities

Early interactions with the environment are considered vital for the development of competencies used later in life for optimal functioning in our society (Center for Special Education Technology, 1989; Lahm, 1988). Young children with physical disabilities, due to their impaired motor abilities and limited vocal capacities, are often at particular risk for less than optimal interactions with the world about them (Parette & VanBiervliet, 1990). For such children, the promise of assistive technology and services holds exciting possibilities (Cain & Taber, 1987; Goldenberg, Russell, & Carter, 1984; Kinney & Blackhurst, 1987), providing options that enable even the most seriously impaired children maximum opportunities to participate fully in the mainstream of our society (Cavalier, 1988; Green & Long, 1980).

Microcomputers have received increasing attention as being important technologies for use with young children with physical disabilities (Brinker & Lewis, 1982a,b; Spiegel-McGill, Zippiroli, & Mistreet, 1989; Horn & Warren, 1987; Parette & VanBiervliet, in press (a); Robinson & Rauschert, 1988). However, such attention given to the importance of one type of technology in the special education and rehabilitation professions has contributed to a paucity of attention being focused on the role of other types of technology with this population. It may also have facilitated the unconscious equation of the term "technology" with that of "microcomputers" among professionals who are working with young children who have physical disabilities.

With the passage of Public Law 100-407, the *Technology-Related Assisatnce for Individuals with Disabilities Act of 1988,* the federal government defined assistive technology in a broad manner. Specifically, an assistive technology device is "any item, piece of equipment, or product system, whether acquired commercially, off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" [29 U.S.C. 2202, §3(1)]. Such a definition, then, would include positioning and mobility devices, augmentative communication aids, computer applications, adaptive toys and games, electronic interfaces, and adaptive environments (Brady, 1988; Garner & Campbell, 1987; Hofmeister &

Friedman, 1986). It would also include homemade battery-powered devices (Burkhart, 1982).

Interestingly, when assistive technology is conceptualized among professionals, the range of services necessary to support the provision of technology to children with physical disabilities is often not considered (Vanderheiden & Dolan, 1985). Assistive technology services have been defined in P.L. 100-407 as "any service that directly assists an individual in the selection, acquisition, or use of an assistive technology device" [29 U.S.C. 2202, §3(2)]. Services would include more obvious types of professionally-provided interventions such as occupational, physical and speech therapy, evaluations, and transportation. It would also include less often considered activities as purchasing and leasing devices and equipment; customizing and adapting devices; repair of devices; training in the use of devices; and the coordination of therapies, interventions and services with assistive technology devices, such as those associated with existing IFSPs or IEPs and programs (Elting, 1987). Training, in particular, has been cited as an important service for children with disabilities and their families (Reeb & Scadden, 1989). Generally, neither families nor children with disabilities receive the training they need to fully utilize the available assistive technology (Cavalier, 1989).

For young children with physical disabilities, technology and related services can result in specific benefits (Bigge, 1982; Enders, 1984) including facilitation of the child's ability to communicate, to be more mobile, to live more independently, to receive an education in the "least restrictive environment", and to work (Behrmann & Lahm, 1983; Developmental Disabilities Program, 1984; Fewell, 1983; Garner & Campbell, 1987; Langley, 1983). It can also enable young children to experience a sense of independence and control over the environment, and allow them to have experiences similar to those of persons who do not have disabilities. By increasing the ability of people with disabilities to function more independently, and to interact with others in the environment, technology and services can facilitate the integration of many children into community settings (Developmental Disabilities Program, 1984; Vanderheiden & Dolan, 1985).

An examination of the professional literature reveals a marked void regarding the needs of young children having disabilities for assistive technology and related services. The present study provides a description of an attempt to address the question of what assistive technology and related services are needed by a sample of young children having physical disabilities. The results

were used to assist in the clarification of questions which could be addressed in state technology planning processes and identified areas of technology-related service provision that might potentially be of concern to policy-makers in Arkansas and other states. The data described were an important component of a federal grant application which resulted in Arkansas being one of the first nine states to receive funding under P.L. 100-407. Implications which are drawn from this investigation may serve as a framework for the development of planning strategies used by other states.

Method

One of the activities which states may use P.L. 100-407 funds for is to conduct a statewide needs assessment to obtain information on the scope and types of services to be provided. Prior to the State of Arkansas receiving funding under this legslation, a group of persons representing six public and private agencies in Arkansas developed a grant proposal focusing on the technology needs of persons with disabilities. The resulting project, Technology Access for Arkansans (TAARK), was designed to: (a) identify the need and quality of technology provisions in Arkansas; (b) to disseminate information about the appropriate technology and funding; (c) to educate Arkansans about technology and funding; (d) to educate Arkansans about technology and advocacy; (e) to develop a coordinated state plan; and (f) to provide technical assistance to the Governor's Developmental Disabilities Planning Council (DDPC). The project was funded in part through the DDPC and in part through the University of Arkansas-University Affiliated Program (VanBiervliet, 1988). Soon after this project was funded at the state level, the federal technology legislation was enacted in August of 1988 providing the impetus to develop a broad state plan addressing the technology needs of persons with disabilities, as well as to develop an application for federal funding under P. L. 100-407.

One of the principal concerns of some persons involved in the state technology planning activities coordinated by the TAARK project was the needs of young children with physical disabilities. It was suspected from the outset that some funding mechanisms for technology were used with less frequency than others. Similarly, the fragmented nature of the service delivery system in the state suggested that other technology service delivery options were inadequate to meet the needs of young children with disabilities. Additionally, there were many concerns which

related to the design of a comprehensive system of technology-related assistance for young children with disabilities, as well as other age groups.

In January of 1989, a Coordinated Planning Committee of 17 individuals representing a cadre of state, private, and consumer organizations in Arkansas met and discussed the implications of Public Law 100-407. Since little information existed relating to the technology needs of persons with disabilities in Arkansas and other states around the country, a decision was made to conduct a survey of persons with disabilities in the state to gain information to be used for planning a comprehensive service delivery system. A Consumer Needs Study Group was organized to draft a survey instrument which would assess the technology-related needs of persons with disabilities across a variety of areas of functioning as well as to explore targeted issue areas of importance for planning purposes. The resulting instrument was subjected to a series of reviews and modifications by the entire Coordinated Planning Committee which, by May of 1989, had grown to a constituency of 48 individuals including persons with disabilities, family members, vendors of technology, and representatives of 25 different public and private organizations.

Survey. Each member of the TAARK Coordinated Planning Committee was requested to provide a mailing list of persons with disabilities for participation in the survey. Approximately 10,000 mailing labels were submitted for use in the consumer survey, constituting a sample of a wide range of consumers including persons with a wide range of disabilities.

Return envelopes were included in the mailout of 10,000 survey instruments. Surveys were mailed during the first week of April of 1989.

Inter-data entry consistency. Data from returns were entered on computer by four project staff personnel who assisted in the data entry phase of the project. All records were entered on a PANORAMA (ProVUE Development Corporation, 1988) database in which a simulated survey instrument was visible to data entry personnel. Data entry consistency was determined by examining a random sample of 10% of the returned consumer and professional survey forms and comparing actual data entered on computer to that exhibited on the survey forms. Since data were entered in a visible screen section, or window, relating to the actual survey instrument, a data entry error rate ranging from only 0 to 5% for various items occurred. Most errors occurred on items requiring the data entry staff to interpret open-ended or fill-in-the-blank responses, *e.g.*, name and

address.

Results

Demographics. A total of 2201 consumer survey forms were received, reflecting a return rate of approximately 20% of the survey forms which were mailed that included return envelopes. Examination of the survey responses indicated that representation of all counties in the state was indicated in returned survey instruments, and that the return rates from these counties typically mirrored population densities of these counties as reported by available Bureau of the Census (undated) data. Also, all age groups were represented among the survey respondents. Of the total respondent class, children ages 0-5 years represented approximately 9.5% (n = 206). From this subset of respondents, children identified as having physical disabilities were selected (n = 104). For this subsample, reports of disability category provided by the parents, guardians, or primary caregivers of the children participating in the survey reflected a wide range of associated problems: speech problems (77%); learning problems (70%); mental retardation (54%); visual problems (44%); breathing problems (21%); auditory problems (20%); head injury (12%); heart problems (11%); emotional problems (6%); and other (24%). These problem categories are obviously not mutually exclusive, but the design of the survey instrument was simplistic and oriented towards persons having marginal reading levels. Persons completing the survey forms were asked to check those categories *which applied to children with disabilities*, probably resulting in many persons checking several categories. However, given the general exploratory nature of the study in which information was to be used for state technology planning seemed to suggest that these categories were acceptable.

The mean age for the participants in the survey was 3.54 yr. (note: children's ages less than 1 year were rounded to accommodate data entry). The number of participants from each age group and percentage of the total early childhood respondent class were as follows: 1 year or less (n = 7; 7%); 2 years (n = 15; 14%); 3 years (n = 24; 23%); 4 years (n =31; 30%); 5 years (n = 27; 26%).

Satisfaction with technology and services. The following information was provided in the survey instrument pertaining to terminology that was used in the instrument:

Assistive devices are designed to overcome handicaps caused by disabilities. Examples

of these devices are wheelchairs, hearing aids, speech aids, and talking alarm clocks. Services for training on how to use and maintain these assistive devices are also important for people who have disabilities.

Respondents were asked to report whether or not they used assistive devices/services in 15 areas as reflected in Table 1. They were also asked to indicate whether or not they had an unmet need for assistive devices/services in these respective areas. It should be noted that these areas are not mutually exclusive, and it was acknowledged that participants might have have difficulty determining which devices and services might fall into particular categories. Also, it was recognized that some participants might have perceived a need that was not legitimate, *e.g.*, responding that a need for computers existed simply because the person had heard of them. However, the general exploratory nature of the survey in which information was to be used for planning purposes, particularly to assist in the design of more sophisticated and scientifically rigorous instruments in the future, justified these seemingly overlapping and non-defined categories.

Technology usage was reported in all areas of life functioning for the children ages 0-5 participating in the survey. As noted in Table 1, the areas in which technology/services was most often used as reported by the respondents were *getting around* (74%); *artificial limbs, braces, and prostheses* (67%); *specialized seating* (59%); *self-help* (54%); and *recreation* (54%). Unmet needs were also reported in all areas of life functioning. In 2/3 of these unmet needs categories (*hearing aids and other hearing devices; specialized cars, vans, and buses; things that help you see; reading, writing, and typing; building accessibility; taking care of the home; using a computer; using a telephone*) children's unmet needs were reported more often than usage. The number of children having unmet needs in taking care of the home, using a computer, and using a telephone were more than eight times the number of children for whom it was reported that technology/services was being used.

Insert Table 1 about here

Expenditures for assistive technology and services. Persons completing survey forms for young children with physical disabilities were asked to report expenditures for

devices, services, and/or maintenance of technology in 1988. As noted in Figure 1, it was reported for many children (27%) that less than $100 for technology devices and services was expended. Expenditures of between $100 and $500 were reported for 10% of the children. Larger expenditures for technology in the range of $501-$1000 were reported for 37% of the respondents, and for 21% personal costs of $1001-$5000 were reported. Expenditures for technology exceeding $5,000 in 1988 were reported for only 5% of the participants. About 1/5 of the survey respondents reported having no knowledge of personal expenditures for devices/services/ maintenance in 1988.

Insert Figure 1 about here

Travel required to receive technology and services. Regarding travel practices pertaining to assistive technology and services, participants were asked: *How far did you have to travel to get the assistive devices/services that you receive?* The design of the survey instrument did not enable a differentiation of travel in those cases where children may have used a variety of devices or services. Also, no delineation was allowed for participants to report whether or not travel was required to initially receive technology services, or travel for the maintenance/service of their technology. Also, the question did not enable the differentiation between regular school bus transportation to and from school services, special transportation for evaluations, for ongoing training, or to pick up assistive technology.

As noted in Figure 2, it was reported for 6% of the respondents that no travel was involved in order to receive assistive devices/services. For another group of respondents (20%), traveling of only 1-20 miles was reported to receive their assistive devices/services. It was reported for 8% of the participants that they had to travel 21-50 miles to receive such services. Reports for 1/4 of the respondents indicated having to travel 51-100 miles to receive assistive devices/services, with reports for 41% indicating that travel in excess of 100 miles was required in order to receive assistive devices/services that were needed.

Insert Figure 2 about here

Funding sources for technology and services. Funding sources for assistive

devices/services which were reported for those respondents participating in the survey included a wide range of mechanisms, though several funding sources appeared to predominate usage by young children with physical disabilities. The three most frequently used mechanisms for funding assistive devices/services reported were Medicaid (54%), the consumer and/or their family (48%), and private insurance companies (39%). Interestingly, it was reported for only 3% of the respondents that assistive technology was provided through the public school systems.

Reports of satisfaction with technology and services. Although survey forms were completed for 104 respondents, many of the forms were incomplete in which persons failed to answer questions regarding levels of satisfaction with technology and related services. Table 2 reflects levels of satisfaction reported for respondents in a variety of areas relating to satisfaction with technology and services.

It was reported for a majority of respondents (93%) that they participated in an assessment or evaluation prior to obtaining their assistive devices/services. It was reported for a majority of respondents (80%) that they were satisfied with the services they received for their assistive devices. However, for more than 3/4 of the respondents, it was reported that *more information was needed* regarding assistive devices/services. This need for information was supported by the high number of unmet needs reported in all categories of assistive devices/services (see Table 1).

Insert Table 2 about here

Table 2 indicates that it was reported for only 20% of the respondents that an opportunity to purchase assistive devices on a "buy-on-time", or credit plan while for 80% of the participants it was reported that such a plan would be helpful to assist them in purchasing needed devices. For a large number of respondents (32%), it was reported that they did not receive adequate training in the use of their devices. It was also reported for 58% of the participants that they did not have an opportunity to try out devices before being required to pay for them. For a substantial number of respondents (34%), dissatisfaction was expressed with the length of time required for the servicing of their devices when they were in need of repair.

Transportation services. Participants were asked the question, *"Are transportation*

services being provided to you?" It was reported for the majority of the infants and young children (76%) that no services were currently being provided.

Discussion

One of the many strengths of the Arkansas proposal funded under P. L. 100-407 was an extensive consumer survey from which these data have been taken. This survey was unique among the first 9 state applications to receive funding under P.L. 100-407. As such, the approach has value that should be given consideration by other states participating in state technology planning (Note: A copy of the survey instrument is available from the senior author on request).

One of the most important outcomes of the study was the identification of unmet need categories for young children having physical disabilities. Examination of the frequency of unmet technology and services needs in varying areas of life functioning reported for participants in the survey suggests that there may be significant numbers of young children having physical disabilities who are being inadequately served by agencies within the service delivery system in Arkansas. These areas of needs differ markedly from those reported for school-age children (3-21 years) with disabilities in general (Parette & VanBiervliet, in press (b)). Similar needs have been reported by states receiving initial funding under P. L. 100-407 (RESNA, 1989). These findings suggest several issue areas that should be examined more closely by professionals in the fields of early education and development.

Need for technology and services promoting greater independence.

Assistive technology and services are recognized as important facilitating agents that promote greater independence for young children with disabilities (Parette & VanBiervliet, 1990). Microcomputers are increasingly being used to develop competencies among young children that increase their ability to interact with the environment more independently, which, in turn, may be expected to contribute to more generalized independence in later life (Cain & Taber, 1987). Since the language contained in both P. L. 94-142 and P. L. 99-457 is being increasingly interpreted to allow for the provision of assistive technology (Morris, 1990; Parette & Bergman, 1990), it might also be expected that computers would frequently be used with these children in educational settings. Though great strides have been made in the use of computer technology for normal school-age childrren in the public schools, particularly in the domains of microcomputer

applications and electronic assistive instruction (Hagen, 1984; Office of Technology Assessment, 1988; Rheingold, 1986; Taber, 1982), the database pertaining to the use of such technology in early intervention settings for young children having physical disabilities evidences a glaring paucity of published reports. Resource constraints may be the greatest determinant of the extent to which computer technologies are widely funded through existing federal legislation. Such resource constraints seem to be inherent in the implementation of P.L. 94-142 and P.L. 99-457 (Harbin, 1988; Mendelsohn, 1989). In fact, resistance to the widescale administrative commitment of available funds to purchase microcomputer technologies for infants and young children with physical disabilities may be observable for some time to come (Mendelsohn, 1989; Office of Technology Assessment, 1988) which is unfortunate given the potential of this technology to facilitate greater independence in many areas of life functioning. The need for research in this area has not been a topic of systematic scientific inquiry, and remains a domain which should be examined more closely by professionals. The present data suggest that only a small percentage of children in this sample are using computer technology and that a great need potentially exists among these children for this technology. Whether or not the reports for needs for computers were *real needs* as opposed an *interest in the technology* is unknown, and should be more closely examined in other studies designed to investigate the needs for and usage of microcomputers with this population.

A recent national survey of special education teacher preparation programs (Blackhurst & MacArthur, 1986) indicated that most institutions of higher education report a need for training in the use if microcomputers. Technology needs data from a survey of a large sample of professionals in Arkansas (Division of Rehabilitation Services, 1989) have indicated that professionals generally express deficits in the area of computer training in their college and university curricula. It may be speculated that if colleges and universities are currently reporting needs in this area, that teachers and other rehabilitation professionals in the field have inadequate skills and are themselves failing to apply existing technologies to this new service population. The reported low incidence of technology funding via the public schools and other state agencies as reported for the survey respondents in this sample of infants and young children seems to support this observation. It should also be noted that Arkansas is in the process of developing and

implementing its comprehensive state plan in compliance with P. L. 99-457 regulations. Thus, full scale implementation of the federal legislation has yet to be accomplished in this state, as is the case in many other states, and it is reasonable to believe that future service approaches, including expanded usage of microcomputers, may be implemented on a wider scale than is currently demonstrated.

The reports that unmet needs in the areas of *using a telephone* and *taking care of the home* (see Table 1) seem to support the importance of parent- or caregiver-reported environmental-related factors in facilitating greater independence for children with physical disabilities. The professional literature has increasingly echoed the need to include measures of environmental factors in intervention strategies targeted for young children with handicapping conditions (Blacher, 1984; Fewell & Vadasy, 1986; Mink & Nihira, 1987). Some investigators have noted that interest in the environment evolves from the theoretical position that children with handicaps are vulnerable to deficits, deviations, and uncertainties within the environment (Bradley, Rock, Caldwell, & Brisby, 1989). It has been posited that in the case of children who have physical disabilities, cognitive capacity may be of a finite nature (Rocassino & Yatchmink, 1983) which would indicate that the limited resources and abilities of the child are critical to sustain both biological and psychological functioning. Thus, the child's attainment of developmental skills would be influenced significantly by social behaviors with which s/he comes into contact. Assistive technolgy has been demonstrated to be an important facilitator of the development of social skills for young children with physical handicaps (Spiegel-McGill *et al.*, 1989), though little literature exists which would suggest that the provision of assistive technology to young children with physical disabilities directly results in a more positive and supportive home environment. Intuitively, it seems reasonable to suggest that technology would contribute to a less stressful home environment, as it would free parents from the demands of caregiving. The impact of such activities as feeding, handling, dressing, and frequent visits to medical personnel may have a variety of effects on mother-child interaction patterns, maternal self-concept, and the degree of stress placed on the family unit (Alpert, Richardson, & Fodaski, 1983; Odom & Chandler, 1990). Children with motor problems such as cerebral palsy may require an inordinate amount of parental time and energy to complete such routine activities as feeding and dressing as a result of their abnormal

muscle tone. These types of problems contribute to the development of adverse environmental conditions which, in turn, may preclude normal family interaction patterns (Beckman-Bell, 1981).

It has also been suggested that research efforts must focus on environmental factors when examining the development of young children with handicapping conditions due to the heterogeneous outcomes that are typically evidenced among children with similar diagnoses of biological risk or definitive handicapping condition. In a most general sense, the body of literature to date suggests that the home environment interacts with particular child characteristics to mold the developmental course (Belsky, 1984; Nihira, Meyers, & Mink, 1983). However, an understanding of the exact nature of such interactions between the child and home environmental variables is obscure, particularly for children who are technology-dependent (Odom & Chandler, 1990).

The recent enactment of Public Law 99-457, the *Education of the Handicapped Amendments of 1986*, provided considerable impetus toward attempting to understand the multiplicity of variables in the home environment that impact upon the development of young children with handicapping conditions. Specifically, all individual education plans (IEPs) require that parental needs, both in terms of involvement and the development of new competencies, be included. Part H of the legislation which focuses on service provision for the infant population specifically calls for the development of an individual family service plan (IFSP), reflecting the high priority of the family unit in any intervention strategies aimed at a child with a handicapping condition. The data base necessary to develop effective plans for this component, however, is far from adequate.

Centralized information. The finding that a need exists for a centralized information system has been expressed by many states (Governor's Task Force on Technology and Disabilities, 1987; Hofmann, 1990; Issue Team on Technology and Person with Disabilities, 1986; RESNA, 1989). There are thousands of systems, *e.g.*, databases, networks, bulletin boards, that contain information relevant to persons with disabilities. However, parents of young children with physical disabilities, as well as many professionals involved in service delivery to this population, typically may be unfamiliar with these sources for information and often do not know where to begin to look for needed services or assistance (Governor's Task Force on Technology and

Disabilities, 1987; RESNA, 1989). In this sample, the data suggested that there were needs expressed for more information in all areas of human functioning identified in the study instrument (see Table 1). Other states have voiced similar needs for information availability on the increasing volume of assistive devices and products (RESNA, 1989).

Problems inherent in developing sophisticated centralized information systems have yet to be fully understood given the infant stage of development characterizing the design and implementation of state technology systems (Parette, in press). However, as experiences with and evaluations of such systems among the states funded under P.L. 100-407 are reported over time, it may be anticipated that a great body of data will be compiled (*e.g.*, see Mayfield-Smith & Wiles, 1989). As this database expands, qualitative changes may be anticipated in the quality of information services provided to families and persons involved in the delivery of services to infants and young children with physical disabilities.

Decentralization of technology services. It has been suggested that, in light of resource constraints expressed by the service delivery system (Barnett, 1988; Smith & Strain, 1988), there is a trend toward more centralized support programs to provide needed information, expertise, and resources accessible to young children with disabilities (Elting, 1987). However, the language of P.L. 100-407 very clearly emphasizes the creation of "consumer-driven" systems of technology-related assistance, placing an emphasis upon the needs of individuals. The focus of the child and the family in the implementation of P. L. 99-457 additionally suggests a need for less centralized service delivery systems that can adequately meet the needs of all young children with physical disabilities. In Arkansas, as is the case in many other states having a rural profile, the centralization of services for this population appears to inadequately address the needs of children. In fact, support for decentralization of services is reflected in the travel reports for young children with physical disabilities (see Figure 2). These data indicated that 2/3 of the children were required to travel more than 50 miles to receive assistive technology and services. Other states have also reported a need for less centralized patterns of technology service delivery (RESNA, 1989).

Funding considerations. While technology can contribute to the independence and ability to infants and young children to interact with the environment (Brinker & Lewis, 1982;

Finnie, 1974), families and service providers frequently face significant financial barriers in attempting to obtain needed technology. Increased flexibility under several existing state programs and elsewhere can facilitate the ready availability of devices and services, without forcing children into programs that are inappropriate to meet their needs.

In the initial examination of the Arkansas study data, there appeared to be an inadequate number of providers of technology services. Medicaid was the most frequently employed funding source for assistive technology, though the criteria of "medical necessity" to receive technology services under Medicaid is very limited, particularly in Arkansas (Markowicz & Reeb, 1989). Typically, only limited technologies in the areas of ambulatory aids, mobility aids, bedroom aids, and sensory and communication aids can be purchased through the Medicaid system, though considerable variations exist across the country.

Examination of the various state proposals funded under P. L. 100-407 (RESNA, 1989) indicates that many states express a need for Medicaid buy-in insurance options for persons with disabilities who have no or limited health insurance coverage. This would allow families of young children with physical disabilities to purchase Medicaid coverage regardless of whether they are Medicare eligible and/or Medicaid eligible. Fees under such a framework would be on a sliding scale according to family income (Hofmann, 1982; RESNA, 1989).

Assistive devices may be considered for Medicaid payment if they fit the definition of a prosthetic device. A prosthetic device means replacement, corrective, or supportive devices prescribed by a physician or other licensed practitioner. It is also possible that assistive technology services/devices could qualify under "other diagnostic, screening, preventive and rehabilitation services". The states differ markedly in their interpretation of eligible Medicaid services (Morris, 1990; Hofmann, 1982). For example, some states may provide Medicaid payment for augmentative communication devices, while other states may disallow the payment because such devices are not deemed to be prosthetic in nature (Cohen, 1989; Hofmann, 1982). There is also an expressed need for Medicaid to provide optional services across the states through the expansion of its definition of durable medical equipment. However, the Medicaid system must also help the states differentiate between what a 'medical necessity' and a convenience is--important concepts in decisions made regarding funding for assistive devices under Medicaid regulations.

States may elect to offer Medicaid services to children living at home without the consideration of family income by modifying the state's Medicaid plan in accordance with the Tax Equity and Fiscal Responsibility Act (TEFRA) passed in 1982 (Section 134 of P. L. 97-35). A wide range of assistive devices may be purchased via the TEFRA mechanism, dependent upon the definitions used by the various states for potential beneficiaries. As of 1988, only 22 states have amended their state Medicaid plan to add the TEFRA-134 coverage option (Bergman, 1990).

Under current law (*Omnibus Budget Reconciliation Act of 1990*, P. L. 101-239), all states participating in the Medicaid program are required to offer EPSDT services to children under age 21. The states are required to inform all Medicaid-eligible children of the availability of EPSDT services, to provide (or arrange the provision of) screening services in all cases when they are requested, and, to arrange for (directly or through referral to appropriate agencies or providers) corrective treatment for which the child health screening indicates a need. Nowhere in the legislation is assistive technology precluded for those children electing to receive EPSDT services (Parette & bergman, 1990). The legislation specifically dictates that states treat any physical or mental problem identified during the screening and assessment process is such "treatment" is coverable under Federal Medicaid law even if these "treatments" are not contained in the State's Medicaid plan.

In the Arkansas study it was found that the families of infants and young children with physical disabilities were the second most frequent source of funding for technology reported. This supports the reports of other states (RESNA, 1989) that there is an additional need for statewide training programs for individuals and families on how to access the Medicaid system.

Examination of the Arkansas survey results relating to purchasing practices for assistive devices/services indicated that over half of the families of infants and young children with disabilities did not have access to some type of credit or time payment program. This need has been reported in some states around the country (Mendelsohn, 1989; Office of Technology Assessment, 1982), and for this sample of children, more than 1/4 of the respondents in the study reported that such an alternative would be helpful. Subsequent to an earlier report by the Office of Technology Assessment (1982), numerous strategies at varying levels have been demonstrated to address the needs of persons with disabilities for credit-based funding systems. Examples are

evident at the state level in the direct loan model established under the New York State Equipment Loan Fund for the Disabled and California's Handicapped Transportation and Supported Employment Loan Guarantee Programs (Mendelsohn, 1989). At the private sector and nonprofit agency level alternatives are being developed across the country in this regard, each being developed with the rationale that with good planning, persons with disabilities are good risks for loans and credit purchases. From a human potential perspective, it makes common sense to invest in technologies for any child early in life, particularly when they would optimize later functioning and diminish resource allocations necessary for the person in adulthood (Barnett, 1988).

Hands-on experiences prior to payment. Coinciding with the aforementioned finding in the Arkansas study was the report that 58% of the respondents were unable to try out their technology before paying for it. Persons who are nondisabled in our free enterprise system are generally accustomed to being allowed a hands-on experience with goods that they wish to purchase. They are allowed to drive new automobiles, try on clothes, and listen to stereos in their homes on a trial basis; all are examples of ways opportunities afforded persons who have no disabilities. Generally, most people take this practice for granted and are unaware of the fact that persons with disabilities more often than not do not have the same freedoms. As a result, they must rely on the judgments of the professionals involved in selecting the technologies for them. The opportunity for infants and young children to try out a particular technology before they, or funding agencies, make a financial investment in it is considerably important in view of the current practice of requiring full payment before an assistive device is ordered (Pfrommer, 1984).

Many times, the technologies are selected primarily because they are familiar to the professional, or because competing interests are existent, *e.g.*, the professional is a consultant for a company/vendor of the technology. In other instances, technologies may be selected solely due to fiscal considerations. In either instance, inappropriate technologies may be acquired for the child with a disability (Cavalier, 1989; Office of Technology Assessment, 1982; Pfrommer, 1984).

Given the relatively recent recognition by the federal government of the importance of early childhood special education programming, as well as the impetus towards the provision of a wide range of rehabilitation services to all persons with disabilities, it seems reasonable to assume that, for a time, a significant number of professionals in service delivery systems across the

country will be ill-prepared to make informed decisions about what constitutes appropriate technology for many infants and young children they will be encountering. This presents an added challenge to institutions of higher education who are charged with the responsibilities of adequately training professionals who will be providing future services to this population. Similarly, an increased responsibility for more comprehensive in-service training is placed on existing service delivery systems wherein professionals are already entrenched and providing services to infants and young children with disabilities.

Transportation. The area in which reported satisfaction in the Arkansas study appeared to be the most deficient was that of transportation, as it was reported for more than 3/4 of the young children with physical disabilities that they did not have such services provided to them. Given that 93% of the respondents indicated having an evaluation prior to receipt of their assistive technology (see Table 2), it must be speculated that transportation is being provided by family members to the sites where evaluations are conducted or they are conducted in the home settings by service providers. This is supported by the report for of 48% of the respondents that family members were paying for the assistive devices and services used by infants and young children in the sample.

Transportation is a critical service for young children with physical disabilities, particularly in states that have a rural nature such as Arkansas where there is a tendency to centralize resources in the larger metropolitan areas. Without transportation to services which are geographically centralized, children may be systematically denied necessary technology and related services that can enhance the quality of their lives (Governor's Task Force on Technology and Disabilities, 1987; RESNA, 1989).

Caution must be exercised in the generalization of these data pertaining to young children with physical disabilities to other areas. Even though a 20% response rate was obtained from consumers in the overall survey, only a small sample of the total population of persons with disabilities was surveyed from across the state. Given that approximately 45,000 children with handicapping conditions under the age of 18 have been reported in Arkansas (U.S. Department of Education, 1989), it would have been most appropriate to have sampled children through the public schools and/or through the State Department of Education. It is not known to what extent

the mailing lists of 10,000 persons compiled by the Coordinated Planning Committee accessed school-based information on the populations of young children with physical disabilities. The inclusion of 104 children in the described study was purely incidental. The persons with disabilities surveyed represented the clientele of a limited cross section of agencies known to be involved in service provision to persons with disabilities. Even though the data suggested that many types of disability categories were reflected in the survey, comparable representation across disability categories was not demonstrated. It was reported for a large percentage of the young children with physical disabilities that a speech problem, a physical disability, or mental retardation, was present while children with head injuries, breathing problems, emotional problems, and heart problems constituted a much smaller proportion of the total respondent class. This, in turn, might have contributed to specific patterns of technology needs being indicated for a particular group of children as opposed to generalized needs of the entire group. Thus, it is unclear what special population was really represented in the findings. Given the limited time frame which impinged upon this exploratory information-gathering study, a more scientifically based sampling procedure was not enabled.

Other states desiring to respond to P.L. 100-407 grant competition initiatives may have greater flexibility to design more rigorous sampling procedures, which would provide a more representative data base having implications for other parts of the country. It was also recognized that there were substantial limitations inherent in the design of a survey instrument that (a) involved consumer participation in the processes of instrument design, (b) had to be developed relatively quickly using group processes over several months, and (3) was relatively easy to understand by persons having marginal reading levels. These factors operated to impose certain constraints upon the design of the survey instrument, and such factors must be considered by other states wishing to optimize consumer and parent usage in the design of such instrumentation.

Conclusion

The potential for assistive technology and services to enhance the quality of life for infants and young children with physical disabilities is contingent upon the nature of systems changes which are presently occurring in this country. The enactment of P. L. 100-407 and P. L. 99-457 have provided the catalysts for these systems changes. Almost one-half of the states have

currently received funding under the former legislation, resulting in important changes in the way in which assistive technology and services are conceptualized and provided to all persons with disabilities. For young children with physical disabilities, the promise held by these changes for facilitating greater independence and eventual integration into community settings as productive citizens is wrought with challenges for professionals. Similarly, as the 1991 deadline for full implementation of P. L. 99-457 approaches, innovative approaches to interpreting the language of this legislation will potentially operate to support P. L. 100-407 by allowing technology and related services to be more frequently embraced as a critical component of children's educational programming.

It cannot be ignored that the potential for young children with physical disabilities to become optimmaly functioning citizens in the society of tomorrow lies in the strategies developed today to meet their special needs. The future will involve access, manipulation, and control of information and the environment (Cain & Taber, 1987). Aided by the tools of assistive technology and services, these children may be able to demostrate the attainment of ultimate functioning (Brown, Nietupski, & Hamre-Nietupski, 1976), with devices and services becoming naturally assimilated as a part of our environment (Hansen & Perlman, 1989). By having an early early awareness of *what is possible,* young children with physical disabilities can broaden their aspirations, as well as the expectations of others regarding their potential.

As a result, society would no longer evaluate educational, therapeutic, or rehabilitation programs on the numbers (rather than importance) of the skills learned by young children with physical disabilities, the amount of direct education and training time available, or the staff-to-individual ratio provided. Instead, society would begin to reference its technological service progress to the technology use in the integrated environments found within our communities where children reside. Because of the significance of this concept to meaningful technology service provision, professionals are challenged to look at expanding their understanding of the needs of this population as well as to remain informed users of advancing technology themselves.

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Table 1

Areas of Assistive Devices/Services Used and Areas of Unmet Needs as Reported for Young Children with Physical Disabilities, Ages 0-5

Area	*n* Use	%*	*n* Unmet Need	%*
Getting Around	61	.74	22	.26
Artificial Limbs, Braces, & Prostheses	35	.67	17	.33
Specialized Seating	39	.59	27	.41
Self-Help	39	.54	33	.46
Recreation	38	.54	32	.46
School Training Aids	32	.52	30	.48
Hearing Aids and Other Hearing Devices	8	.38	13	.62
Specialized Cars, Vans, & Buses	36	.39	56	.61
Things That Help You See	15	.28	38	.72
Reading, Writing, & Typing	10	.27	27	.73
Building Accessibility	14	.26	41	.74
Taking Care of the Home	5	.20	20	.80
Using a Computer	8	.13	53	.87
Using a Telephone	2	.06	32	.94

* Reflects percentage of total number of parents parents/guardians responding to a particular Area item for young children (Column 1).

Table 2

Reports of Satisfaction with Technology Services
Provided to Young Children with Physical Disabilities, Ages 0-5

Survey Question	*n* Yes	%*	*n* No	%*
Were you given an evaluation before getting your assistive device?	86	.93	7	.07
Are you satisfied with the services you receive for assistive devices you use?	74	.80	19	.20
Did you have the opportunity to buy assistive devices/services on a "buy-on-time", or credit plan?	17	.20	69	.80
If not, would a "buy-on-time", or credit plan help?	55	.74	19	.26
Have you received enough training in the use and care of your assistive device?	55	.68	26	.32
Were you able to try out the device before paying for it?	35	.42	49	.58
Are you satisfied with the time it takes to repair/service your device?	39	.66	20	.34
Do you need more information about assistive devices/services that could help you?	70	.76	22	.24

* Reflects percentage of respondent class, *i.e.*, the total number of parents/guardians answering a particular Survey Question for young children (Column 1).

Figure Caption

Figure 1. Reported expenditures for assistive technology for young children with physical disabilities in 1988.

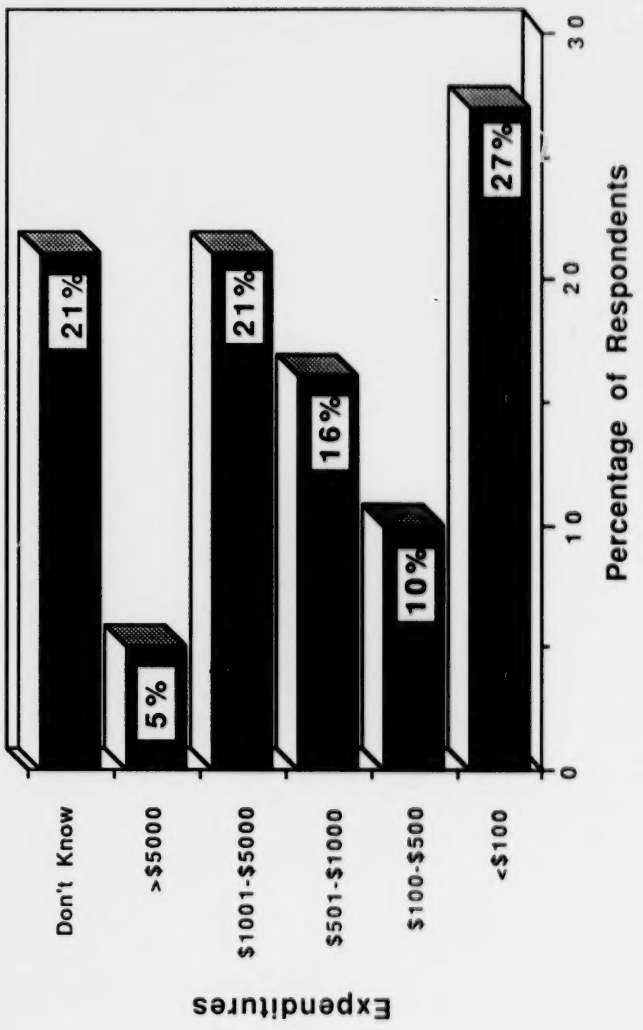
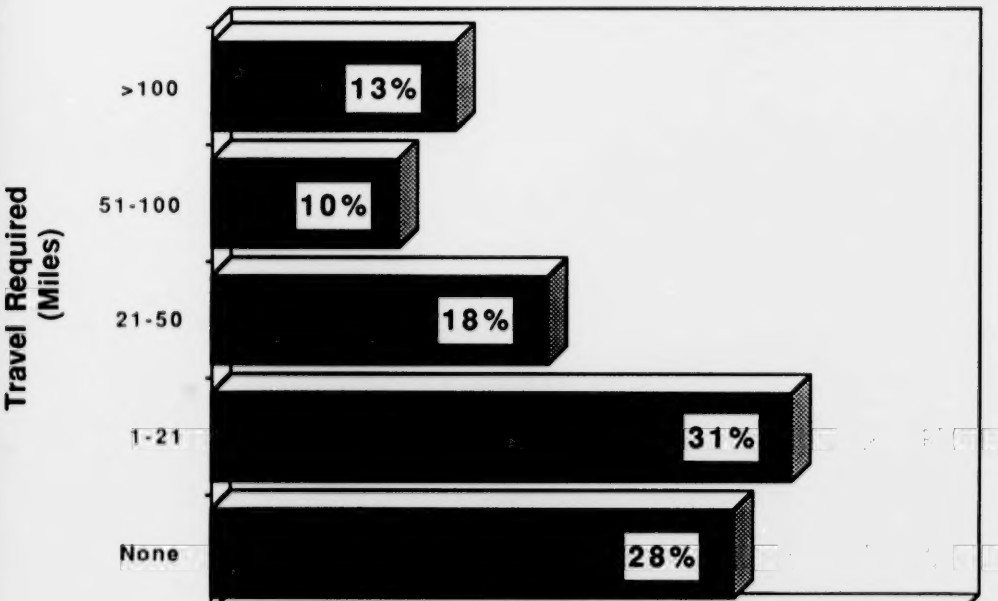

Expenditures
Don't Know
>$5000
$1001-$5000
$501-$1000
$100-$500
<$100
21%
5%
21%
16%
10%
27%
0
10
20
30
Percentage of Respondents

Figure Caption

Figure 2. Travel required to receive assistive technology reported for young children with physical disabilities.


Travel Required (Miles)
>100
51-100
21-50
1-21
None
13%
10%
18%
31%
28%
0
10
20
30
40
Percentage of Respondents